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THE GERMAN WAR ECONOMY, 1918 AND 1943: A COMPARISON (Expanded)

5 October 1943

A comparison of the position of Germany vis-a-vis her opponents in the spring of 1918 with that in the summer and autumn of 1943. Civilian welfare and efficiency, industrial production, military supply, and military manpower are dealt with.

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S U M M A R Y

1. This paper makes a detailed comparison of the situations in 1918 and 1943 to see what lessons may be drawn from the parallels and from the contrasts.

2. In 1918 food, clothing, and fuel were scarce in Germany. The daily food ration in Berlin provided for only 1600 calories, less than two-thirds of requirements. The average weight of the urban adult population declined by more than 20 percent. In 1943, the agricultural lands available are greater, and production of synthetic fibers has prevented any drastic shortage of clothing. Food rations are in general adequate in vitamin content. Synthetic vitamins are widely available. Except for deaths due to epidemic diseases, death rates have risen far less than in 1918.

Russia, Germany's main opponent in 1943, suffers much greater lack of food than did France and England in 1918.

3. By 1918 Germany had almost exhausted her supplies of textiles, was short of rubber, and was desperately short of oil. The production of synthetics, plus stockpiling and exploitation of occupied areas, have prevented similar shortages from arising in 1943. German output of metals, minerals, and chemicals held up well from 1914 to 1918, though her total industrial output declined more than that of England. French production fell sharply.

By 1918, American diversion of her productive capacity to war uses, plus access by the Allies to world resources, gave the Allies a definite and increasing industrial advantage over Germany.

The United Nations in 1943 are enjoying a widening margin of industrial superiority which is greater than was the margin of the Allies in 1918. Now as then the circumstance which is giving Germany's enemies a growing advantage is not the gradual development by them of greater total industrial output but primarily the diversion to war production of an increasing proportion of an industrial productive capacity which has always been superior to that under Germany's control. For example, total Axis 1942 production of steel is some 45,000,000 ingot metric tons; that of the United Nations 120,000,000 tons. Military consumption of steel in the United States in the last quarter of 1941 was at the annual rate of 18.4 million tons, one-fifth of total United States supply. A year later in the United States alone it was at the annual rate of 49.2 million tons, over one-half of total supply, and greater than the total output of the European Axis plus Japan.

4. As a result of this industrial advantage, the enemies of Germany gained a clear advantage in weight of armament before the end of each war. In neither case did this denote inadequately equipped German units; the advantage in munitions was paralleled by superiority of

numbers. German munitions output increased, up to and including 1918; but Allied output increased more. British plus American production of machine guns was 16 times as great in 1918 as in 1917. At the Armistice, the Allies had 5972 "battle planes" on the western front; Germany had 2730. The Allies were also greatly superior in tanks, because of failure of the German high command to appreciate the value of tanks in time to get production under way.

In 1943, the margin of United Nations superiority in munitions is probably greater, and is increasing more rapidly than was the case in 1918. The latter is true essentially because U. S. production is now at a stage corresponding to that anticipated in 1918 for 1919. British Empire and American output and estimated German output in the last quarter of 1942 are: combat aircraft, 13,200 and 4,800; field pieces, 5,730 and 2,055; machine guns 327,000 and 38,000. To British-American totals should be added Russian production figures.

Germany's military production can hardly be greater now than in 1942, and may be less -- though her production of submarines and fighter aircraft has increased significantly. Every category of British-American production rose more than 50 percent from the 1942 average to the second quarter of 1943 except gun ammunition, of which there is a surplus. Output of heavy bombers in the second quarter of 1943 was 286 percent of the 1942 average; of

fighters, .244 percent; of combat vehicles and self-propelled artillery, 267 percent. When Russian stocks of munitions are set against German stocks as a partial offset, and when it is realized that current Russian production easily offsets U.S-U.K. diversion to the Pacific theater, it seems clear, even allowing for supply routes which must be filled, that the United Nations have built up a superiority in equipment which is rapidly increasing.

5. The superiority in equipment is paralleled, as in 1918, by superiority in military manpower. Throughout the war of 1914-1918, the armies of Germany and her associates fell short of 12,000,000 men, while from the period of full mobilization until the collapse of Russia and Rumania, the opposing forces were 3,000,000 or more greater. On the western front, the Germans were outnumbered by 50 percent and probably were able to maintain their position only because divided command prevented full concentration all Allied reserves. The collapse of Russia and Rumania enabled the Germans to gain equality in the west in the spring of 1918. The German spring offensive narrowly missed success. Thereafter, the decline in absolute numbers which had begun -- in mid-1917 -- because of inability to replace losses -- continued to sap German strength at the rate of over 200,000 a month, while American troops arrived at the rate of 250,000 a month.

The manpower position is even worse from the German point of view in 1943 than it was in 1918. The defection of Italy has reduced German plus satellite armed strength to probably not over 10 million men, who oppose 20 million Russians, British and American troops,[1/] some 14 million of them in or at the shores of Europe. Guerrilla bands add significantly to the United Nations figure. On the main front, 4 million Axis troops oppose 6½ million Russian. Most significant, the number of United Nations combat troops in Europe and Russia will grow, despite losses, while the Germans have again reached the stage where the absolute size of their armed forces of combat age must inexorably decline for lack of replacements. The current rate of decline in ages 18-34 is estimated at 150,000 per month.

6. Germany was defeated in 1918 because the maximum war effort she could generate was overmatched -- materially and in manpower -- by her enemies. The same process is being repeated in more emphatic terms in 1943. But certain contrasts between 1943 and 1918 deserve note. Anglo-American forces in 1943 have no foothold within the inner fortress of Europe. The limitations of sea communications and transport prevent full exercise of the leverage of their superior strength until they establish a foothold.

1/ Not including 2 million Russian "interior police."

Germany is well supplied with submarines, with guns, and with fighter aircraft, with which to resist invasion. During the coming period of bad bombing weather, her strength in fighter aircraft may increase significantly.

Unless the Allies postpone invasion for a prolonged period while attempting decisive air bombardment (of which the probable success is not judged here), failure of replacements for the German army in the face of greatly superior material and numbers will again be the immediate condition of breakdown.

THE GERMAN WAR ECONOMY, 1918-1943: A COMPARISON

I. INTRODUCTION

In the spring of 1918, after four years of war, German strength seemed so formidable that the only hope of the Allied commanders was a determined defense which might hold out during the year, until increasing American military participation could make possible a 1919 offensive. Then, from the beginning of April, German power declined, until, in the autumn, Turkey was overwhelmed, the Bulgarian front crumbled, German forces in the west were thrown into retreat, revolution dethroned the Hohenzollerns, and Germany sued for peace.

The autumn of 1943 again marks the end of the fourth year of war. Again the United States has been organizing for war for more than a year, again major defeats have been inflicted on Germany and her allies, and again one of Germany's allies is eliminated from the war. This is, then, the appropriate time for a detailed analysis, in order to determine whether the parallel with 1918 runs deeper. It seems desirable not only to compare 1943 with 1918, but to compare the change from 1917 to 1918 with that from 1942 to 1943.

II. CIVILIAN WELFARE

A. Germany: General

In 1943, after four years of war, the health and vitality of Germany's civilian population are far better than in 1918. The economic blockade of the last

war was effective in reducing substantially the living standard of the German people; in the present war, however, the agricultural lands at Germany's disposal are so much greater in extent, substitutes for imports are so much further developed, and provision for storage so much more complete, that the loss of foreign trade has not materially affected Germany's standard of living.

B. The German Food Situation, 1918 and 1943.

In 1918, the food shortage was so severe that the daily ration in Berlin provided for only 1600 calories, against estimated minimum requirements for health and efficiency of 2500 calories per day. By contrast, the caloric value of the daily diet in October 1942 was 2320, and the daily caloric intake has generally increased somewhat since that low point. The 1918 shortage of meat, fats, and oils was particularly severe. Consumption of meat fell from a pre-war average of 1050 grams per person per week to an average of 135 grams per person per week in the summer of 1918. Consumption of fats and oils fell from a pre-war level of 28 grams per person per week to 7 grams per person per week at the time of the armistice. At the present time, consumption of fats and oils in Germany is at least twice as great as in 1918, while protein consumption per person is almost three times the 1918 level. Moreover, vitamin deficiencies in diet are now widely supplied by the use of synthetic vitamins, which were not available in 1918.

C. German Civilian Health and Efficiency, 1918 and 1943.

The injurious effects of inadequate diet in the Germany of 1918 were widespread. The average weight of the urban adult population declined more than 20 percent; the birth rate in 1918 was less than half the pre-war rate; and the death rate from disease rose precipitately.[1] For example, the death rate from tuberculosis, promoted by malnutrition, approximately doubled during the period 1914-1918.[2]

Against these figures, the 1943 vital statistics for Germany are much more favorable. The birth rate in the present war has declined less than 20 percent. Except for certain diseases of an epidemic nature, the increase in disease-incidence has been much smaller in the present war.[3] There is no evidence of a general and substantial decline in the average weight of the adult population.

The 1918 health and morale situation was made worse by serious fuel and clothing shortages. The shortage of fuel was due both to a decline in coal production and to transportation difficulties. While some congestion exists in the transportation system in 1943, the household fuel supply has been much more adequate than in 1918.

1/ The Reichsgesundheitsamt estimated that between 1914 and 1918, 762,000 deaths in Germany were attributable to diet and clothing deficiencies. Lack of sanitation due to lack of soap should undoubtedly be included as a cause of these deaths.

2/ In the first half of 1918, tuberculosis deaths amounted to 41,847, as compared with 40,374 all of 1913.

3/ The tuberculosis death rate increased only from .66 to .81 per thousand between 1939 and 1942.

Likewise, the production of synthetic fibers on a large scale has made it possible to clothe the German civilian population far better in 1943 than in 1918. Discomfort exists now; severe suffering occurred in the winter of 1918.

Thus the figures suggest that the decline in health and efficiency of the German people was much greater in the war of 1914-1918 than in the present conflict. In spite of urban bomb damage, no important shortage of housing has yet developed, both because mobilization of the armed forces freed a significant amount of housing, and because the practice of doubling up to accommodate shelterless families has been generally employed and with success. Family life has been disrupted by the practice of moving non-working family members from heavily bombed industrial areas, but, aside from this, adequate shelter has in general been available. It seems likely, therefore, that neither inadequate housing nor inadequate clothing nor inadequate nutrition will seriously affect the vitality of the German people in 1943.

D. Conditions Among Germany's Opponents.

By contrast with the German position in the current war, the health and vitality of Germany's principal enemy, Russia, has declined more during the present war than did the health and vitality of the major European Allies during 1914-1918. For example, consumption of bread grains per person in France during 1918 was about

80 percent of the pre-war level, and meat consumption was 75 percent of the pre-war average. Sugar was not rationed until 1916, when the monthly allowance per person was set at 750 grams; later it was reduced to 500 grams. No restrictions at all were placed upon the consumption of wines and oils. From these figures it is apparent that the French population suffered no serious privation from food shortages. In England the situation was likewise relatively good. By 1918, the submarine menace had been largely overcome by the convoy system, and food supplies were moving into the country regularly.

Although statistics reflecting the current Russian civilian position are meagre, those available indicate a very stringent situation. Bread, the staple of Russian diet, is rationed at the rate of 400 to 700 grams daily, depending on the category of the rationholder (categories range from that of essential war worker to unproductive dependent). Other foods are rationed at the following monthly rates: sugar, 100 to 500 grams; butter and substitutes, 400 to 800 grams; meat and substitutes, 600 to 2200 grams; cereals, 1300 to 2000 grams. Foods in addition to those covered by ration allowances are extremely scarce and expensive, and accordingly beyond the reach of most of the urban population of Russia. The food position in Russia has frequently been even more critical than above indicated, by reason of the fact that butter and meat were often unobtainable and sometimes ration

values could not be satisfied even by substitutes.

It may reasonably be concluded, in view of Russia's substantial food, clothing, and fuel shortages at the present time, that Russian civilian health and vitality have deteriorated more in the present conflict than did the health and vitality of the major European Allies by 1918.

III. INDUSTRIAL RESOURCES AND PRODUCTION

A. General

The basic industrial and military resource is manpower, and fundamentally it was for lack of manpower that Germany was defeated in 1918. But such a generalization is not very enlightening; nor is it true in unquilified form, for scarcity of certain strategic material resources played its part. It will be well to analyze separately three aspects of the German position in 1918 and in 1943, two of which depend in major part and the third almost entirely upon the total manpower situation. German industrial resources and production, her output of munitions, and her supply of military manpower,[1/] will, in this and the two following sections, be compared in turn with those of her opponents during each of the two conflicts.

B. Industrial Output of the Belligerents, 1914-1918.

The German industrial position, relative to that of the Allies, was deteriorating in 1918 in two respects. In certain strategic materials, Germany was approaching exhaustion. Moreover, her total supply of basic raw materials for war use was falling behind that of her opponents. In an absolute sense, German war production was being maintained. But the Allies had access to industrial resources and productive capacity greater than those under German control. By 1918, the flow of materials from war plants to the battlefronts was giving the Allied armies an increasing preponderance in material strength.

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In the heavy industries, which are the basis of military production, German output held up well during the war period. A fairly reliable index of minerals and metals output in Germany is as follows:[1]

1913	1914	1915	1916	1917	1918
100	84	77	85	89	82

There was a sharp drop after 1913 because of mobilization of the army and curtailment of raw material imports; but output in 1918 was almost as high as in 1914, and, except for curtailment of war production in November, would probably have been higher. The stability of the index as a whole conceals declines in output of coal and of certain non-ferrous metals, balanced by increases elsewhere, e. g. in aluminum. If chemicals were included in the index, the comparison between 1918 and earlier war years would be even more favorable. In England, as in Germany, the output of materials important for munitions output was maintained or perhaps increased. France, however, lost about three-fifths, one-fifth, and one-third of her pre-war iron and steel, coal, and textile capacity through invasion, and her output in the heavy industries must have declined greatly. Thus Germany's output in this field was maintained at least as well as that of France and Britain.

1/ The index is from an unpublished manuscript by Al Wohlstetter of the National Bureau of Economic Research.

In total industrial output, which is less important for military purposes, Germany did not fare so well relative to Great Britain. Total industrial production in both Germany and England declined from 1914 to 1918. Comparative indices for Germany and England are as follows:

	1913	1914	1915	1916	1917	1918
Germany	100	83	67	64	62	57
England	100	93	94	87	84	79

Neither index can be regarded as highly reliable. However, an index of total freight originating in a number of important German industries 1/ drops by 24 percent from 1914 to 1918, and it seems certain that this index significantly understates the decline in total industrial output. 2/ The index of industrial output presented above is thus corroborated. The English index is based upon scanty evidence, but it may safely be asserted that the decline in industrial output in Britain was less than in Germany.

The decisive industrial advantage of the Allies in 1918 lay, however, not in their greater success in maintaining production, but in their possession of

1/ The index is weighted by employment in each industry. It is from the study by Wohlstetter.

2/ Primarily because this index does not include a number of industries which declined more than did industrial output as a whole.

industrial strength which, including that of America, had from the beginning been superior to that of the Central Powers. To this was added access to the resources of the world so that there was no acute shortage of any strategic material. British industrial capacity was diverted to war production later than was that of Germany, and that of the non-belligerent United States much more slowly. But even as early as 1915, the flow of materials from America bolstered the Allied position. By the summer of 1918, even though the United States' war program was not in full swing, the increasing diversion of British and American resources to war output gave the Allies the advantage in equipment described in Section IV.

C. German Shortages of Strategic Materials, 1918

Germany's position was weakened in 1918, not merely by her total industrial inferiority, but by the near-exhaustion of her stocks of certain strategic materials for which she had depended upon external sources. In addition to textiles, which were very important for the standard of living, these included certain materials of strategic significance in a military sense, especially oil and rubber. Production of substitutes was quite inadequate, and the gradual exhaustion of stocks created a serious situation. Motor fuels and lubricants are said to have been "extremely scarce" throughout 1918, and rubber was so tight that many trucks

and automobiles were running on iron tires. There is little doubt that these shortages, together with a serious situation in the replacement of horses on the western front, restricted the mobility of the army in its last great offensives. By the time of the armistice, the oil situation was desperate, and in itself was probably sufficient to preclude the possibility of further effective resistance. One of the most important contributory factors in Austria-Hungary's collapse is said to have been lack of lubricants to keep the railway system operating on anything like the required level.

D. The German Position, 1943.

In 1943, there are no German shortages comparable to the 1918 lack of textiles, petroleum, rubber, and horses, though the steel alloy and petroleum positions are rather tight. In this respect Germany is far better off than in 1918. The production of synthetics and to a lesser extent pre-war stockpiling and successful exploitation of occupied territories, e.g., the extraction of Rumanian oil, Norwegian molybdenum, and Russian manganese, have prevented the shortages which developed in 1918. The loss of ferro-alloys from Russia and Finland would, however, make the 1944 ferro-alloy position very tight. Clothing needs of the civilian population and many industrial and military needs are being met with synthetic textiles. Five hundred thousand tons of synthetic fibers, or over one-half of the total supply, 650,000 tons of synthetic petroleum

products, or over one-third of the total supply, in the neighborhood of 170,000 tons of synthetic rubber, or enough to meet all essential requirements, are being produced in 1943.[1/] No one material is critically short. This is true in spite of bombings to date, including that of Ploesti. Future bombings or the occupation of Axis-controlled areas may of course change the supply position for 1944.

During the first World War, except for Rumania, the occupied territories were not of great economic benefit to Germany--except that stocks of materials seized at the time of occupation brought important temporary relief. This time, in spite of bitter resistance in spots, Germany has made her occupation more fruitful. Not only have the conquered and satellite areas furnished valuable flows of certain badly needed materials; they have bolstered German war supply as a whole. The flow of goods and services from external Europe to Germany in 1942 is estimated (in value terms) at one-fifth of Germany's domestic war expenditure. That contribution may have declined somewhat in 1943.

As important as the flow of goods and services has been the flow of manpower. Some five million foreign civilian workers, in addition to one and one-half million prisoners of war, are at work in Greater Germany. Germany's industrial problem is essentially a manpower problem, as it was in 1914-1918. Because Germany had no appreciable reserve of labor power upon

1/ All data are in metric tons.

which to draw, mobilization sharply decreased the civilian labor force. Except for the utilization of foreign workers, total industrial output and with it war output, would have declined sharply in 1942 and 1943. It is estimated that, apart from bomb damage, it did decline slightly (perhaps 3 percent) from 1942 to 1943, and that bombing has additionally reduced the rate of output by between 5 and 10 percent, during the last half of 1943. Without the exploitation of foreign labor, the decline would have been greater. Because of that exploitation, German war output plus the aid drained from the occupied areas is probably fully as great as was the maximum possible war output of Germany alone before her conquests began.

E. Comparison With the Allied Position, 1943

The German industrial position relative to that of her opponents is nevertheless as hopeless in 1943 as it was in 1918, and for the same reason. That reason may be epitomized by summarizing the steel situation. The 1943 steel production of Axis Europe and Japan combined is some 45 million ingot tons. That of Russia, Great Britain, and the United States aggregates about 120 million ingot metric tons--well over two and one-half times as much. The ratio may be taken as a crude measure of the general industrial advantage of the United Nations over the Axis. While Germany has progressed

in industrial strength since 1918, Russia and the United States have progressed more rapidly. Having failed to conquer England and Russia before their strength equalled her own, and having failed to block the swelling flow of war goods from the United States, Germany in 1943 faces the full power of a combination which industrially as well as in manpower is far stronger than she.

On the United Nations side, raw materials are no more a limiting factor in 1943 than they were in 1941. The production of synthetic rubber to replace the natural product after Japanese expansion, and the successful substitution of many other materials for tin, solved two major problems. Now, as during 1914-1918, swelling war output is not associated with correspondingly increased total output of materials. It is true that in aluminum, synthetic rubber, and in certain strategic materials used in small quantities, there have been spectacular increases. United States plus Canadian production of aluminum, for example, which was less than 2100 million ingot pounds in 1942, totalled 1500 million ingot pounds during the first half of 1943. But total United Nations output of carbon steel in 1943 will have increased by less than 10 percent above 1941; and copper output, after climbing during 1942, has fallen in 1943.

The war use of these materials, however, has soared. Direct military consumption in the United States of strategically important materials showed increases

from 1941 to 1942 varying from 200 to 500 percent. Military consumption of aluminum, 54 percent of the total supply in 1941, rose to 84 percent in 1942; that of copper from over one-third of total supply to over two-thirds. Military consumption of steel in the last quarter of 1941 was 4.6 million ingot tons, one-fifth of the total United States supply. In the period from October through December 1942 it was 12.3 million tons, over half of total supply, and an amount equal to the total output for all purposes in Japan plus Axis Europe.

IV. MILITARY SUPPLIES

A. General

There is no clear demarcation between industrial resources and military supplies, and hence much of what was said in the preceding section is equally relevant here. For example, oil and rubber are in a sense vital military supplies. It has already been noted that severe scarcities in these materials, and in the number of houses, interfered with the mobility of the German army in the great 1918 offensives, while the Allies, thanks to their ready access to foreign sources of supply, did not suffer from a similar embarrassment.

By the summer of 1918, the Allies enjoyed an increasing superiority in volume of materiel. This was not due to any failure of German munitions production, nor did it denote incomplete equipment of German units. Just as the German level of output of basic materials was adequate with relation to the size of the war effort, so also was the level of output of munitions. For the manpower which Germany placed on the field, she produced an adequate supply of rifles, machine guns, artillery, and ammunition--though the ammunition situation was somewhat tight in 1918. The Allied superiority in materiel was merely a component part of the widening margin of superiority which developed that year in the total Allied war effort.

B. Comparative Production of Materiel, World War I.

Production of munitions increased steadily on both sides. British production of munitions of almost all kinds increased throughout the war, up to and including 1918. Curtailment of a fewproduction schedules was due to sufficiency of supply, rather than to failure of production. United States production, while it did not get under way in time to add to supplies at the front in early 1918, did assure future supplies and thus enable a free use of existing stocks. Combined British and American production of machine guns rose from 87,000 in 1917 to 340,000 in 1918, and of rifles from 1,500,000 to 3,500,000. (In addition, the United States brought into the war 600,000 Springfields.) British production of artillary increased sufficiently to supply the swelling American army. American production of service airplanes leaped from 13 in the first quarter of 1918 to over 2,000 in the last quarter. This however, was more significant as a promise for 1919 than as a source of power in 1918.

Because of this increasing output, the amount of equipment in the field increased steadily. For example, not counting a few obsolescent pieces used early in the war, the British Expeditionary Forces alone had the following supplies of guns on the western front at various dates:

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Date	Field guns and howitzers	Heavy guns
25 Sept 1915	1987	120
1 July 1916	3237	576
17 April 1917	4006	1620
21 Mar. 1918	3961	2093
11 Nov. 1918	4273	2215

To picture the total increase in Allied striking power in the West, even if no allowance is made for increase in French strength, the growth in power of the American army must be added to the growth in British equipment strength.

But German production of munitions was likewise increasing. Monthly production of various items increased as shown below.

	Production (tons)
Powder:	
Oct. 1915	4,750
Apr. 1917	8,000
Apr. 1918	12,000
Oct. 1918	14,300
Machine guns;	
Aug. 1916	2,300
Autumn 1917	14,400
Oct. 1918	13,000
Light Artillery:	
Dec. 1915	480
Feb. 1918	1,943
June 1918	about 2,500

For the manpower which Germany was able to place in the field, there was a surplus of rifles, machine guns, and light field pieces. Heavy artillery was somewhat short, but this was due to a lack of trained artillery men, rather than of guns.

Motor pools were scarce in Germany; this is traceable to the oil and rubber scarcities.

As to tanks, the Allied position was overwhelmingly superior to the German. Some idea of this disparity can be gathered from the following data. British (not Allied) tank production in 1918 was 1,391 units. German production figures are not available, but they must have been very small since only 90 tanks reached the front on the German side in the whole of 1918, and of these only 15 were of German make, the rest being captured machines. German experts after the war, however, were unanimous in attributing this admittedly very serious German lack to the failure of the High Command to appreciate the value of tanks in good time and not to the inability of German industry to build them.

With regard to planes also the balance was clearly on the Allied side in 1918. No good comparative production or strength figures have been found, but the position at the time of the Armistice is probably a reasonable index of the situation throughout the earlier months of the year. American figures give the Allies (France, Britain, U. S. and Belgium) 5,972 "battle planes" as against Germany's 2,730. (Italy and Austria-Hungary in this case practically cancel each other, a circumstance which suggests that their omission from this entire comparison is not a serious matter.)

While the Germans did not suffer from specific shortages of equipment, except for tanks and planes, they did suffer from lack of food, clothing, and foodstuffs.

It became gradually apparent that the entire German war effort was inadequate to cope with the growing Allied strength. Allied superiority grew as 1918 went on.

C. Comparative Production of Materiel, World War II.

During the present war, superiority of the United Nations over the Axis in output of military supplies was clearly evident even in 1942. In combat aircraft, for example, the European Axis produced 4,800 planes in the last quarter of 1942, compared with a combined British and American output of 13,200. For field pieces, the corresponding figures are 2,055 and 5,730; for machine guns, 38,000 and 327,000. In most categories of munitions, combined British and American production for the last quarter of 1942 was three or four times the output of the European Axis. The relevant figures are presented in table which appears below. To these figures must be added Russian output totals.

TABLE 1.

AMERICAN AND BRITISH EMPIRE AND ESTIMATED EUROPEAN AXIS PRODUCTION OF MILITARY SUPPLIES
Fourth Quarter 1942

Type	European Axis Production	American & British Production
Combat Aircraft	4,800	13,200
Machine Guns	38,000	327,000
Rifles and Small Arms	1,050,000	1,086,000
Field Artillery (75 mm and over)	2,055	5,730
Anti-Aircraft Guns	5,330	23,800
Anti-Tank Guns	2,700	12,000
Tanks	3,100	12,300
Trucks	63,000	223,600

Consideration of comparative production trends in 1943 makes the contrast between Axis and United Nations output even more impressive. The increase in superiority of United Nations equipment and munitions over that of the Axis, in 1943, is even more rapid than was that in 1918. This is due essentially to the fact that, in regard to production of war goods, the United States is now in a position which corresponds to what would have been attained in 1919, rather than to 1918. A survey of the statistics will make the situation clear.

German military production can hardly be significantly greater now than in 1942, and may well be less. War production, begun long before 1939, was already under full swing by 1942. The only increase might be from greater curtailment of civilian production, and in view of the already restricted civilian position, the possible shift could not be great. Against this must be set the estimated decrease in total industrial output referred to in the previous section. Perhaps some deterioration of industrial capital must now be made good. Considering these factors, the assumption that the current rate of war output is equal to the average rate for 1942 is undoubtedly a maximum assumption.

This does not mean that Germany cannot in some categories throw into battle more equipment than she has hitherto used. In artillery in general, anti-aircraft guns in particular, and ammunition, her position has probably

been so easy that she can, when the occasion arises, increase her use of these items and still maintain her strength. Curtailment of her production of tanks may have freed capacity for other use. In submarines, her strength may have increased through 1942 and the first third of 1943, and her position in 1943 may be, in numbers, much better than the average position in 1942. Submarine effectiveness for attacking convoys has, however, been much reduced by Allied countermeasures. In airplanes, wastage has currently exceeded production, but production is being accelerated and wastage must be stepped up if total strength is to be kept from increasing.

Consider on the other hand the United Nations position. Russia has starved her civilian industry to feed the military. Her military output has increased significantly from 1942 to 1943.

The military output trends for the British Empire and the United States are presented in tables on the following page. They indicate that the only category in which output has not risen more than 50 percent from the 1942 quarterly average to the second quarter of 1943 is gun ammunition, of which there is a surplus. The increase in production of heavy bombers was 186 percent.

Table 2

AMERICAN AND BRITISH EMPIRE MATERIEL, 1942-1943 PRODUCTION: DOLLAR VALUES
(in millions of dollars)

Type	Quarterly Average, 1942	First Quarter 1943	Second Quarter-1943
Combat vehicles & Self-propelled artillery	786	1171	1314
Artillery (other than s.p.)	332	555	527
Small arms & infantry weapons	333	476	496
Gun ammunition	644	688	673
Small arms ammunition	365	685	832
Aircraft bombs	136	217	222

Table 3

AMERICAN AND BRITISH EMPIRE PRODUCTION OF COMBAT AIRPLANES, 1942-1943
(number of units produced)

Type	Quarterly Average 1942	First Quarter 1943	Second Quarter 1943	Second Quarter 1943 as Percent of 1942 Quarterly Average
Heavy bombers	1139	2313	3265	186
Other bombers and flying boats	3965	5280	6650	167
Fighters	5470	6736	7917	144

In interpreting these data, it must be remembered that Germany had a stock of munitions at the beginning of the war far greater than that of the United Nations. Whereas the main functions of German production in recent years has been to make good wastage, the United Nations

(other than Russia) have had to give their armies their initial stock of equipment, and to fill supply channels leading from the points of production to distant theaters of operation. Allowance must be made, too, for diversion to the Pacific theater.

On the other hand, the data take no account of Russian production. If Russian supplies of munitions in June 1941 are taken as a partial offset to the German stock of equipment, and if current Russian production is set against British and American diversion to the Pacific, it is clear that during 1943 (much earlier in some categories) the United Nations have been building up a great and rapidly increasing superiority in equipment. Both the superiority and its rate of increase far exceed those of 1918. But in certain categories especially needed for defense, German is either very strong now (anti-aircraft guns), or has been rapidly increasing production (fighter airplanes).

V. MILITARY MANPOWER

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A. General

For a time in the spring of 1918, Germany's strength in military manpower in the field was greater, relative to that of her opponents, than it had been since 1914. But the spring offensive failed, and thereafter the relative manpower situation deteriorated rapidly.

At no time between the full mobilization of the Allied forces and the collapse of Russia had the armies of the Central Powers approached in size the combined strength of the Allies. While accurate statisticis are impossible to obtain, it is probably true that throughout this period the armies of Germany and her associates--including both combatant and non-combatant troops--fell short of 12 million, while those of the Allies ranged three million or more higher.

B. Comparative Military Manpower, World War I.

From 1915 through 1917, the English and French armies on the western front outnumbered the Germans by at least 50 percent, and possessed equally great superiority in equipment. An important reason for Germany's ability to maintain her position in the face of these odds was the absence of unified command among the English, French, and Italians. Lacking one command, the Allies failed to pool their reserve strength, either on the offense or on the defense. The greatest Allied concentration at a given point was always the greatest possible French or British concentration, never that which might have been achieved by a combina-

tion of all available French and all British reserves.

The strength of the German army reached its peak in absolute terms at about the middle of 1917. Thereafter it declined. The reasons were two. Heretofore Germany had been reaching deeper into her manpower barrel for men; now she was close to the botton, and had to depend largely upon the ageing of the young male population for her new crop of soldiers. A complementary factor was the necessity of increasing deferments of potential soldiers to maintain adequate production of munitions. A postwar committee of inquiry estimated that perhaps one million men fit for service were deferred. Except for this one million men, and possibly some artisans and small tradesmen, every physically available man was in the military forces. From mid-1917 on, net casualties exceeded inductions.

Nevertheless, with the collapse of Russia's huge army and the crushing of Rumania's twenty divisions, Germany's relative position suddenly improved tremendously. Because of the Russian and Rumanian collapse, the total strength of the Allied armies was reduced to between 12 and 13 million, including two million American troops almost all of whom were still in the United States. Nine million of the Allied total were French and British. Numerically, the armies of the Central Powers totalled over 11 million, of whom over 7 million were German. In combatant troops,

a British War Cabinet committee reckoned Allied strength at 5.4 millions, as against 5.2 for the Central Powers.

In early 1917, the Allies had possessed the 50 percent superiority referred to above, on the western front. But toward the end of the year, they were forced to rush troops to Italy, even while Germany began to shift 1.5 million or more men[1] from the Russian and Rumanian fronts to the west. In December, the divisional count in France was: Germans, 151 divisions; Allies, 169. Since an Allied division was apparently between 5 and 10 percent larger than a German strength, the discrepancy in numbers was still considerable. But by late March, when the Germans began their last great drive, their divisions numbered about 190, to 173 for the Allies--a position of equality. In May the count was 204 to 188, again approximate equality. The last 40 German divisions were however second-rate troops, while the additions to Allied strength were fresh though poorly trained Americans.

The German drive failed. Details of its near success need not be narrated here, except to note that the crisis brought unification of Allied command at last. Once the offensive failed, the German position rapidly deteriorated. The accretion of manpower from the East was a never-to-be-repeated accession of capital strength. Since losses

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1/ Of the total of 1 3/4 million who were there.

exceeded gains, there was an inexorable decline in manpower month by month, as combat attrition wore away manpower. To this problem were now added serious difficulties connected with the disintegration of troop morale. Desertion, going over to the enemy, refusal to rejoin units after leave, slacking, etc., all became common occurences. Total loss of strength exceeded inductions by over 200,000 per month. The average strength of battalions steadily declined until, by the end of the year, it was little more than half of that called for in the army's tables of organization.

On the Allied side the picture, which had been dark enough during the spring days of 1918, rapidly improved during the remainder of the year. United States troops arrived in France in unexpectedly large numbers. They were for the most part poorly trained, but their freshness and their numbers had an enormously invigorating effect on the spirits of the exhausted French and British. There is no doubt that their arrival became the dominant factor in the whole manpower situation by the time of the Armistice. How, from a purely quantitative standpoint, matters had changed from the approximate equality of the early months of the year to the time of the Armistice may be seen from the following table.

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Table 4.

Comparison of Combatant Strength on the West Front
(approx. 11 November 1918)

Allies		Central Powers	
British	1,202,000	German	2,912,000
French	1.554,000	Austro-Hungarian	100,000
U. S.	1,175,000		
Italian	23,000		
Belgian	115,000		
Total Allied	4,069,000	Total Central Powers	3,012,000

Even at the time of the Armistice, the Germans were no worse off than they had been during 1915-1917. The difference lay in the exhaustion of German oil supplies, the shortage of feedstuffs, food and clothing, even at the front, the increased effectiveness of the Allied command, and above all Germany's utter inability to replace her losses of over 200,000 a month, while a quarter of a million fresh American troops with full equipment were being added monthly to the Allied forces. When Bulgaria collapsed in September a gap opened in the battle lines which the Germans were unable to fill. The future appeared hopeless. German sued for peace.

C. Comparative Military Manpower, World War II.

For the German manpower situation of 1918, 1943 offers a deadly parallel, broken only by the fact that this time no enemy's collapse has provided a temporary reversal of the trend.

In the autumn of 1942, German forces (army plus air force) totalled some 8 million of her own forces, plus

perhaps 3 to 3.5 million Italian and satellite troops. The effective military strength of these forces was qualified by the fact that large numbers must police occupied areas and combat large-scale guerilla activity. Opposed were some 19 million Russians, British, and American, 15 million of them in or at the shores of Europe. If we omit Russian home guard troops, these figures should be reduced by two million. On the main battlefront, 6 million Russian combat troops opposed German armies over 25 percent weaker.

Between 1942 and 1943, Russia has been able to replace her casualties, and can continue to do so. American strength, aside from the Navy, has grown to over 7 million, with ample reserves available if she wishes to call them up. Total United Nations strength in or at the border of Europe has grown by the number of United States troops transported to that area.

Meanwhile Italy's defection has reduced European Axis strength to not over 10 million. Of the 8 millopn German troops, slightly older and less efficient than the 8 million of 1942, 4.5 million are of combat ages (18-34). Not more than 4 million troops now face the Russians. Germany has accumulated her total military capital; she has no source of men but the youthful classes just reaching military age. They do not exceed the number of men of the armed forces reaching age 35. Thus gross casualties are also net losses. Either the combat army is declining in size, or, through dilution with older men, it is deteriorating

in quality, while the strength of Germany's opponents in men and arms is increasing. The net German monthly loss in the age group 18-34 is estimated at 150,000. Whatever the range of error in this estimate, the rate of net loss is considerable. It is being inflicted by attrition on the Russian front. Any added attrition which may occur through Anglo-American ashore in western and southern Europe, will hasten the rate of German decline.

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VI. CONCLUSION

In two ways the German position surveyed in the preceding pages is better in 1943, relative to 1942, than it was in 1918, relative to 1917. In 1918, civilian standards of living had become seriously impaired. They had markedly deteriorated since 1917. Malnutrition and inadequacy of clothing and fuel had not yet reduced war production; but these conditions may have impaired the "will to fight". In 1943, on the other hand, civilian supplies are well maintained. In 1918, shortages of oil and of rubber affected German military activity; in 1943, supplies are more adequate.

In other ways the change in Germany's position from 1942 to 1943, relative to that of her opponents, is less favorable than that from 1917 to 1918. The rate at which the margin of advantage in war output is widening in favor of Germany's enemies is greater now than it was in 1918. The level of Germany's relative strength in military manpower is now lower than in 1918, and the rate of decline in her relative strength is at least as great.

The comparison would not be complete without noting other factors. In 1918, the opposing forces were fully engaged on European soil. Now British and American forces have no foothold in the inner fortress of Europe. The limitations of sea communications and transport prevent full exercise of the leverage of superior strength, until

a broad foothold is established. The borders of the fortress are well fortified, and Germany is still well equipped with fighter aircraft and other weapons with which to oppose invasion. During the coming season of bad bombing weather, her fighter strength may increase. The battle-line in Russia is still so located as to make further retreat militarily feasible. Germany might still be able to reduce her strength in the East, and to save the remaining forces by retreat while meeting invasion forces at the coastline with all available reserves.

The United Nations possess a new weapon not yet matured in 1918, with which to attack from the air the industrial base of German war activity; but the United Nations have not yet critically weakened that base.

It is not the function of this paper to prophesy, or to estimate the results in 1943 of this or that course of action possible in prospect or in retrospect. It is possible, however, to say that now , as in 1918, German industrial output and production of munitions are adequate for the size of the total war effort she can exert; that her maximum war effort is overmatched by that of her opponents; and that, unless the Allies postpone invasion for a prolonged future period in favor of air bombardment, failure of replacements for the German army in the face of greatly superior enemy material and numbers will again be the immediate condition of breakdown.

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Commodity shortages, Germany 2.19.3
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Casualties " 3.12.2
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Materiel " 3.11.2
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Army " 3.11
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Industry " war 2.17
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